

**ELECTROCOAT RESIN COMPOSITIONS CONTAINING CARBAMATE  
FUNCTIONAL RESINS HAVING ONE OR MORE QUATERNARY  
AMMONIUM GROUPS AND AT LEAST ONE CARBAMATE FUNCTIONAL  
REACTIVE ADDITIVE**

**ABSTRACT**

The invention provides a resin composition comprising (A) a polymer comprising at least one primary carbamate functional group and one or more quaternary ammonium groups, and (B) a carbamate functional reactive additive that is generated in situ during the production of polymer (A).

The invention also provides a method of making a electrocoat resin composition comprising (A) a polymer having at least one primary carbamate group and one or more quaternary ammonium groups and (B) a carbamate functional reactive additive, the method comprising reacting a monomeric polyisocyanate, and a compound comprising at least one group that is reactive with isocyanate and at least one carbamate group, so as to produce both (1) an intermediate product having at least one carbamate functional group and at least one isocyanate functional group, as well as (2) a carbamate functional reactive additive having no isocyanate functionality, reacting said intermediate product with a compound having at least one epoxy group and at least one isocyanate reactive group, said reaction occurring in the presence of the reactive additive so as to produce a carbamate functional resin having at least one epoxy group, reacting said at least one epoxy group with a tertiary amine compound in the presence of an acid to provide a carbamate functional resin having one or more quaternary ammonium groups, said reaction occurring in the presence of the reactive additive to provide a resin composition comprising (A) a carbamate functional resin having one or more quaternary ammonium groups and (B) a carbamate functional reactive additive.

Finally, the invention provides electrocoat coating compositions comprising the resin composition of the invention and a method of using said electrocoat coating compositions.